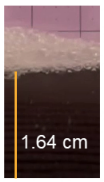
Your grade: 100%

Your latest: **100%** • Your highest: **100%** • To pass you need at least 80%. We keep your highest score.

Next item →

1. **Quiz setup** 1 / 1 point

Your goal for this quiz is to process the "liquidVideo.mp4" and calculate the height of the liquid in each frame, like this:



In a previous video, the liquid was isolated using color thresholding. However, for this quiz you will use the background subtraction technique covered previously. The advantage of this method over color thresholding is that it should provide more consistent results if used on new videos with liquids of different colors.

The following questions will guide you through the process. We suggest checking your answer to a question before proceeding to the next one. You can take this quiz as many times as needed.

Question

Your first task is to isolate the liquid using the background subtraction method. Therefore, you'll need to define a background frame to use. Which option provides the best background frame for this video?

- ○ All of the frames averaged together.
- ◉ The first frame of the video.
- ○ The middle frame of the video (number 120).

Correct
If your video has a frame with a stationary background and no foreground object present, then this is a great choice for a background frame.

2. Now that you have chosen what to use as the background frame, your next task is to test out the background subtraction method on some example frames. 1 / 1 point

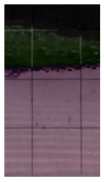
Question

What is the correct result after performing background subtraction on frame 175?

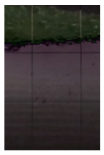
○

○

◉



○



Correct

3. Now your task is to isolate the liquid from the images corresponding to the difference between the background and your chosen example frames. We encourage you to experiment around with a few options. After completing this task, answer the following question. 1 / 1 point

Question

What approach is the best method to segment the liquid?

- ○ Grayscale binarization with Otsu's method
- ○ Grayscale binarization with adaptive thresholding
- ◉ Grayscale binarization with a manual threshold value
- ○ Clustering

Correct
This is the ideal method because it will properly isolate the liquid even when it is not present or occupies the entire frame.

4. Now that you have segmented out the liquid from the background subtraction image, your next task is to use morphological operations to improve the mask by removing unwanted true pixels (such as from the grid markings on the background) and unwanted false pixels (such as from the foam). Answer the following question after finding a suitable method. 1 / 1 point

Question

After performing background subtraction, grayscale thresholding, and morphological operations on frame number 175, what is the percentage of true pixels (corresponding to the liquid) in your final mask?

61.23

Correct
Your final result may vary depending on your methods. The result we got was 60.42.

5. Now apply the entire workflow you've developed in this quiz to the entire video, such that for each frame you: 1 / 1 point

1. Perform background subtraction
2. Segment out the liquid from the resulting image
3. Improve the mask using morphological operations
4. Use the mask to calculate how full the container is

Once completed, answer the following question.

Question

Assume that each frame of the video is 3.4 cm in height. What is the average height of the liquid 16.7 seconds into the video?

1.9

Correct
For our own algorithm, we got a height of 1.86 cm.

Here is our result for the entire video.